

Patent Claims

Method for Welding Conductors

1. Method for welding electric conductors (32) such as litz wires using ultrasound, in particular litz wires among one another for producing transit or end nodes (54, 58) or litz wires with a carrier, whereby the conductors are introduced into a compression chamber (30) that is bounded by at least two boundary elements and are welded after the compression chamber is closed, whereby ultrasound is applied via a first element such as a sonotrode (16) and the conduits to be welded are acted upon by pressure via the first element or a second element, such as a counter electrode (18), and whereby a characteristic magnitude of the compression chamber is measured, wherein after the conductors (32) are welded, the compression chamber is decompressed and ultrasound is supplied on the welded conductors, after which the characteristic magnitude is measured.
2. Method according to claim 1, wherein the compression chamber (30) is bounded by at least three elements (16, 18, 20), and after the welding, at least one previously fixed and locked element (20) in relation to the welded conductor (32) is decompressed and unlatched.
3. Method according to claim 1, wherein a geometric value such as height, width or diagonals of the compression chamber (30) is selected as a characteristic magnitude, especially the spacing between the first and second elements (16, 18).
4. Method according to claim 3, wherein the geometric value is measured by a displacement pickup (38).
5. Method for quality checking of conductors (32) that have been welded in a compression chamber (30) of an ultrasound welding device (10), especially into litz wires welded into a transit or end node (54, 56) or litz wires welded on a carrier, whereby the compression chamber is bounded at least by an ultrasound-applying first element such as a sonotrode (16) and a second element such as a counter electrode (18), whereby the conductors are acted upon by pressure via the second or first element, characterized by the operations:
 - Introducing the welded conductors (32) to be welded into a compression chamber

(30),

-Compacting and welding the conductors (32) with simultaneous cross section diminution of the compression chamber (30),

- Decompressing the compression chamber (30), whereby the welded conductors (32) remain between the first element (16) and the second element (18),

-Renewed application of ultrasound with simultaneous action of pressure on the welded conductors (32) via the first and/or the second element (16, 18) and

-Measurement of a characteristic magnitude of the compression chamber and/or shape of the welded conductors (32).

6. Method according to claim 1 or claim 5, wherein the conductors (32) are subjected to pressure via the second element (18).

7. Method according to claim 5, wherein the quality of the welding is evaluated as a function of the measured characteristic magnitude of the compression chamber (30) and/or the shape of the welded conductors (32).

8. Method according to claim 5, wherein the height and/or width and/or diagonals of the compression chamber (30) are measured as characteristic magnitudes of the compression chamber (30), for example using a displacement pickup (38).

9. Method according to at least one of claims 1 - 8, wherein the renewed application of ultrasound takes place over a duration T with $10 \text{ ms} \leq T \leq 250 \text{ ms}$.

10. Method according to at least one of claims 1 - 9, wherein the renewed application of ultrasound with simultaneous action by pressure on the welded conductors (32) takes place with a pressure P with $1 \text{ bar} \leq P \leq 4 \text{ bar}$.

11. Method according to at least one of claims 1 - 10, wherein ultrasound with simultaneous action of pressure is applied when the compression chamber (30) is open to destroy or largely destroy the weld when welds of lesser quality are established on the welded

conductors (32).

5 12. Method according to at least one of claims 1 -10, wherein ultrasound with simultaneous action of pressure is applied again with a decompressed pressure chamber (30) for selective recompression of the weld when proper welding on the welded conductors (32) is established.

10 13. Method according to preferably claim 5 for checking the quality of welded conductors, especially welded litz wires such as transit or end nodes or litz wires welded on a carrier, wherein the welded conductors are arranged between a first element that applies ultrasound vibrations, such as a sonotrode, and a second element, such as a counter electrode, and wherein ultrasound is applied via the first element, and changes in spacing between the first and second elements with simultaneous action of pressure on the welded conductors taking place during or after the application are measured.